

Regulating and Licensing Commercial Space Transportation



Presented to: Interagency Satellite
Workshop

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Date: October 17, 2018



Purpose

Discuss how the Federal Aviation Administration's Office of Commercial Space Transportation (FAA/AST) regulates and licenses launches and reentries:

- AST Background
 - Statutory Authority
 - Operations Licensed and Regulated by AST
 - Commercial Space Transportation Regulations
- Overview of the AST License and Permit Approval Process
With a Focus on *Launch Licenses* and *Payload Reviews*

AST Background

Background

The U.S. space launch program today has 3 sectors:

- Civil (NASA)
- Military (DOD)
- Commercial (FAA-licensed)



The commercial sector had its official start in 1984 with Executive Order 12465

- DOT designated as lead Federal agency for enabling private-sector launch capability

Congress passed the Commercial Space Launch Act soon afterwards in 1984

- Regulatory oversight for the commercial sector was given to the Office of Commercial Space Transportation
- Originally within DOT and the Office of the Secretary

AST is one of five lines of business (LOB) within the FAA:

- Office of Aviation Safety (AVS)
- Office of Airports (ARP)
- Air Traffic Organization (ATO)
- **Office of Commercial Space Transportation (AST)**
- Office of Security and Hazardous Materials Safety (ASH)



Statutory Authority

Title 51 U.S. Code Subtitle V, Chapter 509 ***Commercial Space Launch Act (CSLA)***

Authorizes the FAA to license commercial launch and reentry activities and the operation of launch and reentry sites as carried out by a citizen of the United States.

Directs the FAA to:

- Exercise this responsibility consistent with public health and safety, safety of property, and the national security and foreign policy interests of the United States, and
- Encourage, facilitate, and promote safe commercial space launches and reentries by the private sector.

Who Needs a License or Permit From FAA/AST

An entity must obtain a license:

- To **launch** a launch vehicle from the United States;
- To **operate** a launch or reentry site within the United States;
- To **reenter** a reentry vehicle in the United States.

An entity must obtain an experimental permit:

- To launch a reusable suborbital vehicle from the United States for research and development, or prior to obtaining a launch license, to show compliance with requirements for a license or crew training.

A U.S. citizen or an entity organized under the laws of the United States or any State must obtain a license:

- To launch a launch vehicle outside the United States;
- To operate a launch or reentry site outside of the United States; or
- To reenter a reentry vehicle outside of the United States.

FAA does not license launches or reentries carried out by and for the US Government

- NASA and the Department of Defense often carry out their own launches.



What types of activities is FAA/AST involved in?

- **Commercial Launch/Reentry Licenses**

- *Expendable Launch Vehicles (ELV)*
- *Reusable Launch Vehicles (RLV)*
- *Air Launch (ELV/RLV)*

- **Experimental Permits**

- **Commercial Site Operator Licenses**

- Launch and Reentry Sites

- **Safety Approvals (14 CFR part 414)**

- **Safety Inspections**

- Launch/Reentry Operations and Sites



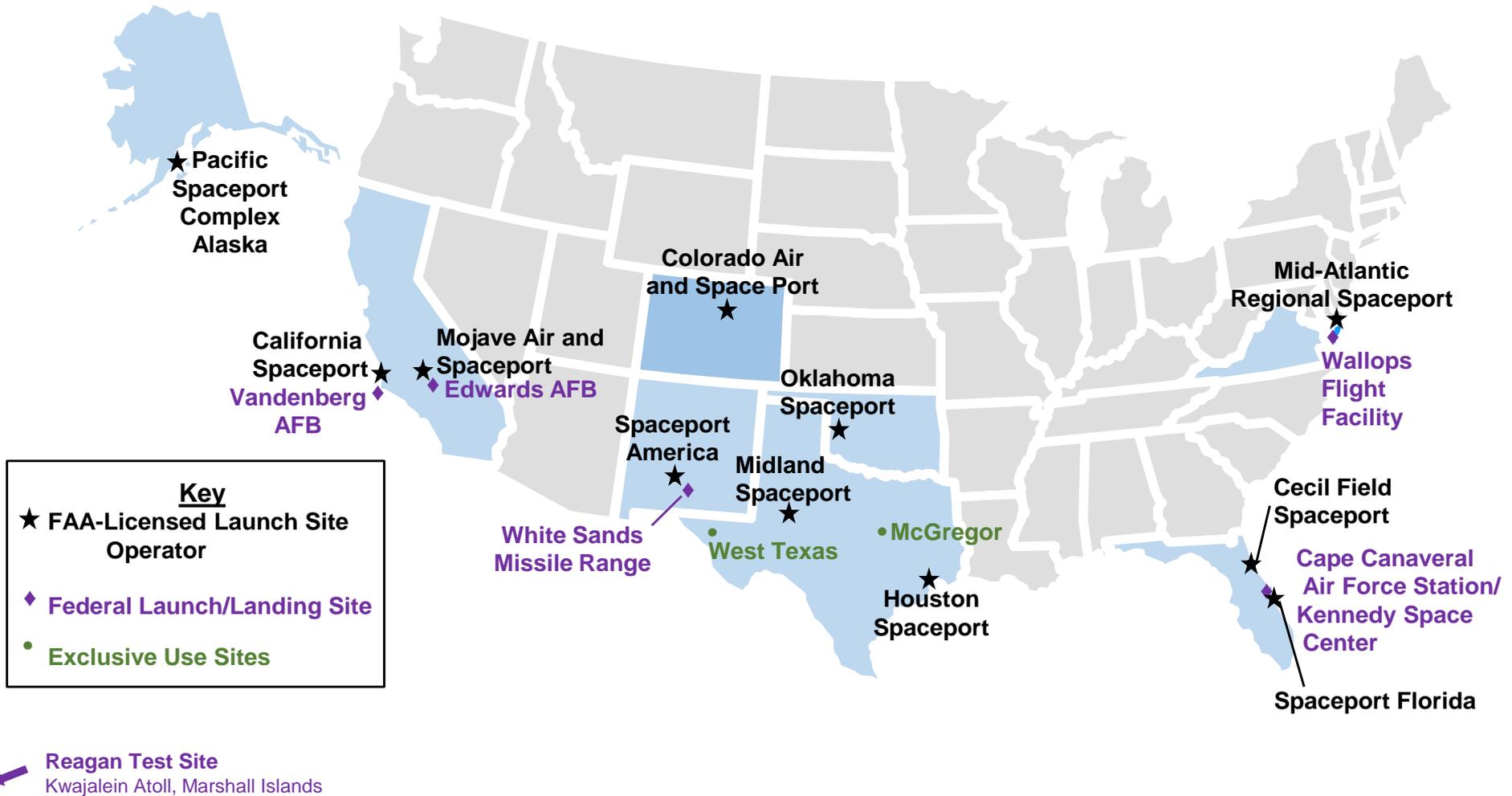
Compliance Monitoring & Safety Inspections

FAA/AST performs compliance monitoring for licensed or permitted activities to ensure compliance with:

- Statute
- Regulations
- Representations made in a license or permit application
- Terms and conditions of a license or permit

Some compliance monitoring activities take place at a site by the licensee or permit recipient for manufacturing or launching. This monitoring may include an on-site safety inspection of hardware, tests, processes, or procedures.

U.S. Launch Sites – “Spaceports”



Types of Licenses

Launch License (for Expendable Launch Vehicles)

- *Launch-specific license* authorizes a specific launch or multiple launches with nearly identical parameters (vehicle design, launch location, trajectory, payload, etc.).
- *Launch Operator license* authorizes launches of a range of payloads and trajectories for a family of vehicles from the same site.

Reusable Launch Vehicle (RLV) Mission Licenses

- *Mission-specific license* authorizes a licensee to launch and reenter one model (may authorize more than one RLV mission, but identifies each flight).
- *Operator license* authorizes a licensee to launch and reenter any of a designated family of RLVs within authorized parameters, including launch sites and trajectories, transporting specified classes of payloads to any reentry site or other location designated in the license.

Reentry Licenses

- *Reentry-specific license*
- *Reentry-operator license*

Launch or Reentry Site Operator License

- Authorizes operation of a launch or reentry site.

Experimental Permit

- An experimental permit may be issued by the FAA for reusable suborbital rockets that will be launched or reentered solely for—
 - Research and development to test new design concepts, new equipment, or new operating techniques;
 - Showing compliance with requirements as part of the process for obtaining a license under this chapter; or
 - Crew training prior to obtaining a license for a launch or reentry using the design of the rocket for which the permit would be issued
- Carriage of people or cargo for compensation or hire is not allowed.
- Valid for a one year, renewable term from the date the experimental permit is issued.
- For an experimental permit, an applicant must comply with CFR part 437 to obtain the permit.
- AST reviews and makes a decision on an application within 120 days of receiving an accepted experimental permit application.

Launch and Reentry Site Operator Licenses

For a launch site operator license, an applicant must comply with 14 CFR part 420 to obtain this type of license.

For a reentry site operator license, an applicant must comply with 14 CFR part 433 to obtain this type of license.

These types of licenses authorize the licensee to operate a launch or reentry site:

- A launch or reentry site operator may offer its site to multiple operators
- Remains in effect for five years from the date the license is issued
- License issuance does not confer exclusive use of airspace
- Any vehicle operator wishing to launch or reenter at a licensed site must also obtain a separate authorization



Commercial Space Transportation Regulations

Part 400–Basis and Scope

Part 401–Organization and Definitions

Part 404–Regulations and Licensing Requirements

Part 405–Investigations and Enforcement

Part 406–Investigations, Enforcement, and
Administrative Review

Part 413–License Application Procedures

Part 414–Safety Approvals

Part 415–Launch License

Part 417–Launch Safety

Commercial Space Transportation Regulations

Part 420—License to Operate a Launch Site

Part 431—Launch and Reentry of a Reusable Launch Vehicle (RLV)

Part 433—License to Operate a Reentry Site

Part 435—Reentry of a Reentry Vehicle Other than a
Reusable Launch Vehicle (RLV)

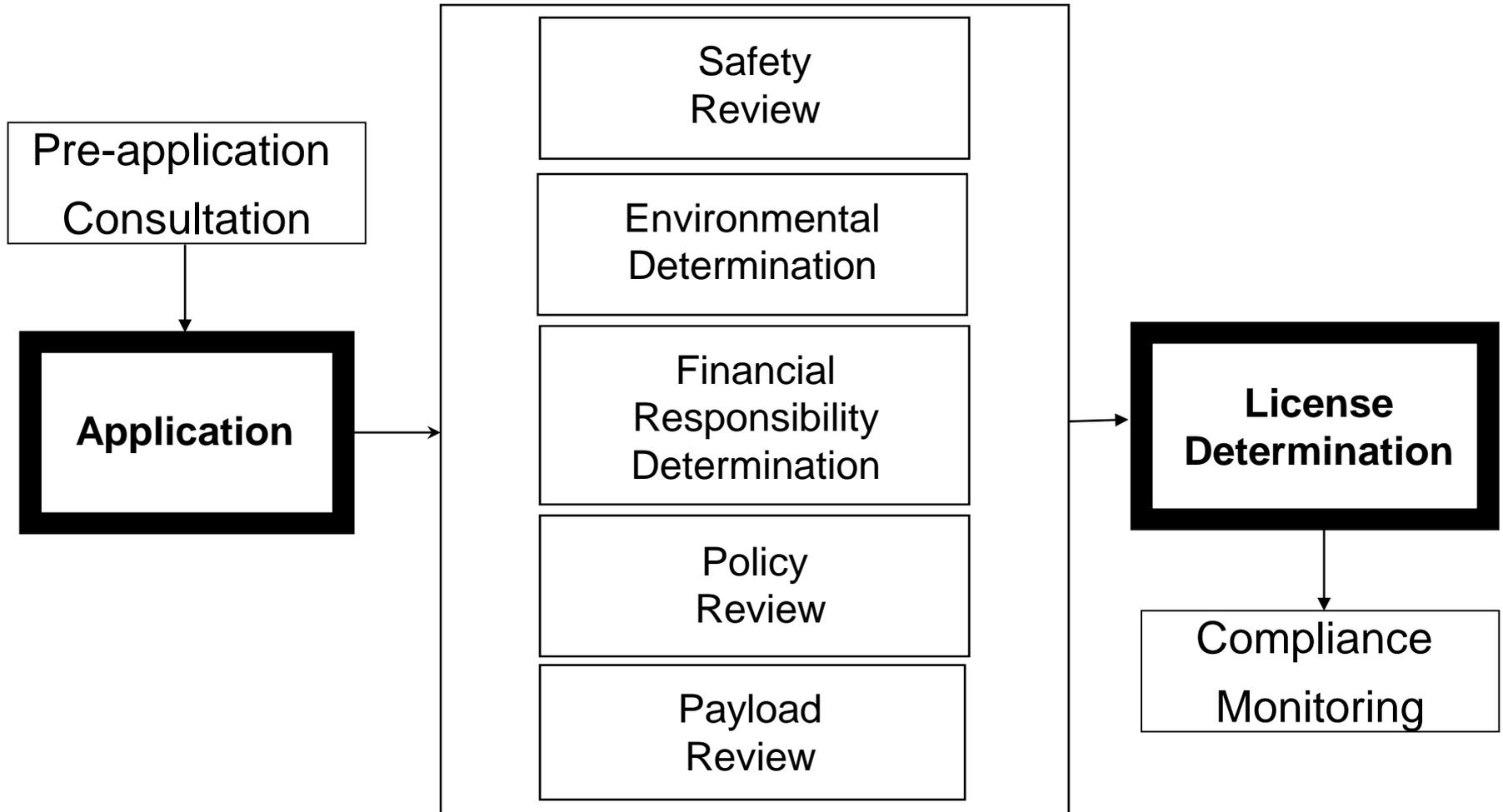
Part 437—Experimental Permits

Part 440—Financial Responsibility

Part 460—Human Space Flight Requirements

AST License and Permit Approval Process

Launch & Reentry Licensing Process Flow



License Determination

- AST will initially screen an application to determine if it is complete enough to start its review.
- AST reviews and makes a decision on an application within 180 days of receiving an accepted license application.
 - Evaluation of license application is documented in an internal AST technical evaluation, which is the basis for a licensing determination.

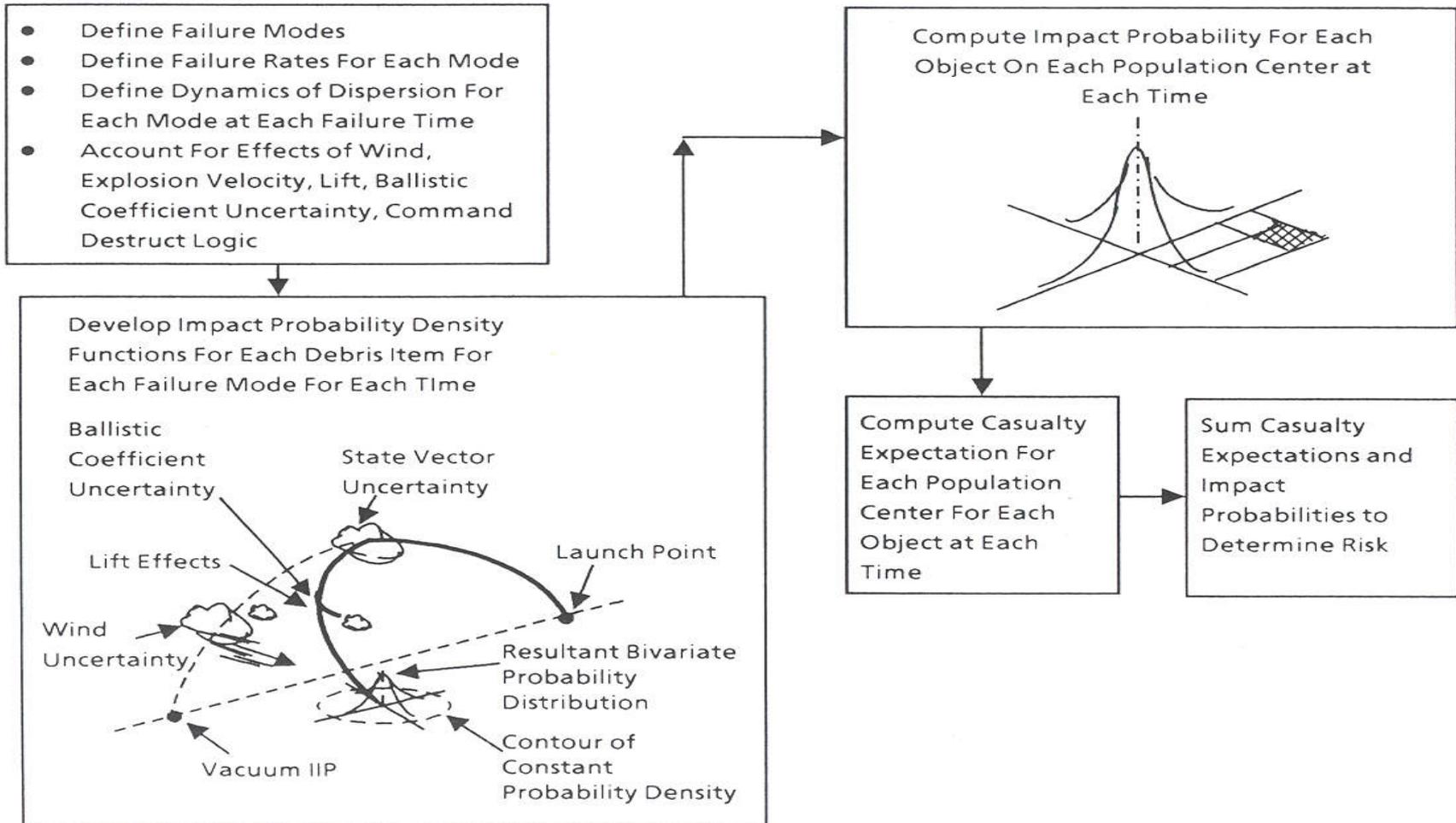
Pre-Application Consultation

- Encompasses discussions with prospective applicant prior to submittal of a license application.
- Allows a prospective applicant to familiarize AST with its proposal and AST to familiarize prospective applicant with licensing process and type of information required in an application.
- Provides prospective applicant with an opportunity to discuss issues and identify any unique aspects of its proposal, and develop a schedule for submitting an application.

Safety Review

- Determines whether an applicant is capable of safely launching a launch vehicle and its payload or reentering a reentry vehicle and its payload.
- Involves technical analyses:
 - Quantitative analyses focus on the reliability and functions of safety-critical systems, and the hazards associated with the hardware, and the risk those hazards pose to public property and individuals near the launch site, along the flight path, and upon reentry
 - Qualitative analyses focus on the organizational attributes of the applicant such as launch safety policies and procedures, communications, qualifications of key individuals, and critical internal and external interfaces

Safety Review - Risk Computation



Safety Review - Public Risk Criteria

Risk is defined by the safety community as the product of the probability of occurrence of an event and the consequences of that event

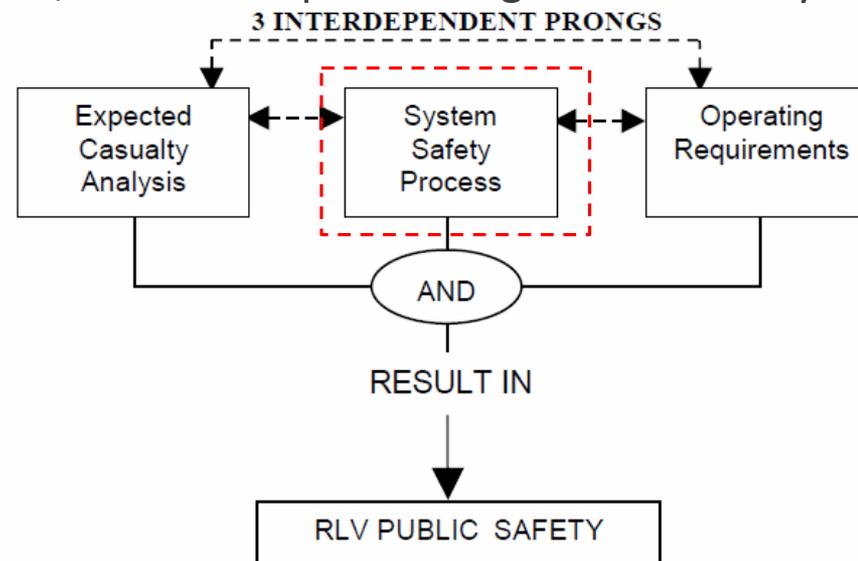
Collective and individual risk criteria must be met under a license.

- Risk level to collective members of the public exposed to vehicle hazards (debris, toxics, and far field blast overpressure) must not exceed an expected average of 1×10^{-4} casualties per mission ($E_C \leq 1 \times 10^{-4}$)
- Risk level to an individual member of the public must not exceed 1×10^{-6} per mission.

Safety Review - Approach to Public Safety for RLV Missions Under 14 CFR Part 431

FAA requires an operator to use a 3-pronged approach to ensure safety:

1. Acceptable public risk measured by E_c – The FAA uses collective and individual risk measures to quantify the public risk
2. Logical, disciplined System Safety Process -The System Safety Process consists of the structured application of system safety engineering and management principles, criteria, and techniques throughout the life cycle of a system



3. Operational Requirements – ensure mission risks do not exceed the design capability as assessed in the system safety process for nominal and non-nominal operations

Environmental Review

Analyzes the environmental effects (e.g., air quality, water quality, noise) associated with the proposed operations

- Often begins prior to the formal license application review process because it is typically a long-lead item.

Licensing launches and reentries and operation of launch and reentry sites is considered a “Major Federal Action” and is therefore subject to the National Environmental Policy Act (NEPA).

Financial Responsibility Determination

AST conducts a Maximum Probable Loss (MPL) analysis to determine the amounts of financial responsibility required of the licensee to cover:

- Pre-flight (third party), Pre-flight (government property), Flight (third party), and Flight (government property)

Under 14 CFR part 440, third parties are considered:

- Government workers and their contractors, and
- Persons who are not involved with the launch.

Proof of financial responsibility required by licensee is usually fulfilled by purchase of liability insurance. Licensee is not required to obtain insurance that is more than:

- \$500M for third-party liability,
- \$100M for government property, or
- Maximum liability insurance available at reasonable cost.

Subject to congressional appropriation, Federal government indemnifies launch or reentry operator for claims above insured amount.

- Up to about \$3B (\$1.5B adjusted for inflation from January 1989).

Policy Review

- Determines whether a proposed launch or reentry operation or operation of a launch or reentry site presents any issues affecting U.S. national security or foreign policy interests, or international obligations of the United States.
- A major element of the policy review is the interagency review, which allows government agencies to examine the proposed mission from their unique perspectives
 - Department of Defense
 - Department of State
 - NASA
 - FCC & NOAA

Interagency Review

The table below indicates the FAA's partner agencies and their primary areas of responsibility:

Partner Agency	Primary Area of Responsibility
DoD Department of Defense	Issues related to US national security
DoS Department of State	Issues related to US foreign policy
FCC Federal Communications Commission	US commercially-owned communications satellites and frequency issues involving FCC licensing of transmitters, including those on launch/reentry vehicles for telemetry
NASA National Aeronautics and Space Administration	The effect of commercial space activities on NASA programs
NOAA National Oceanic and Atmospheric Administration	US commercially-owned remote sensing satellites

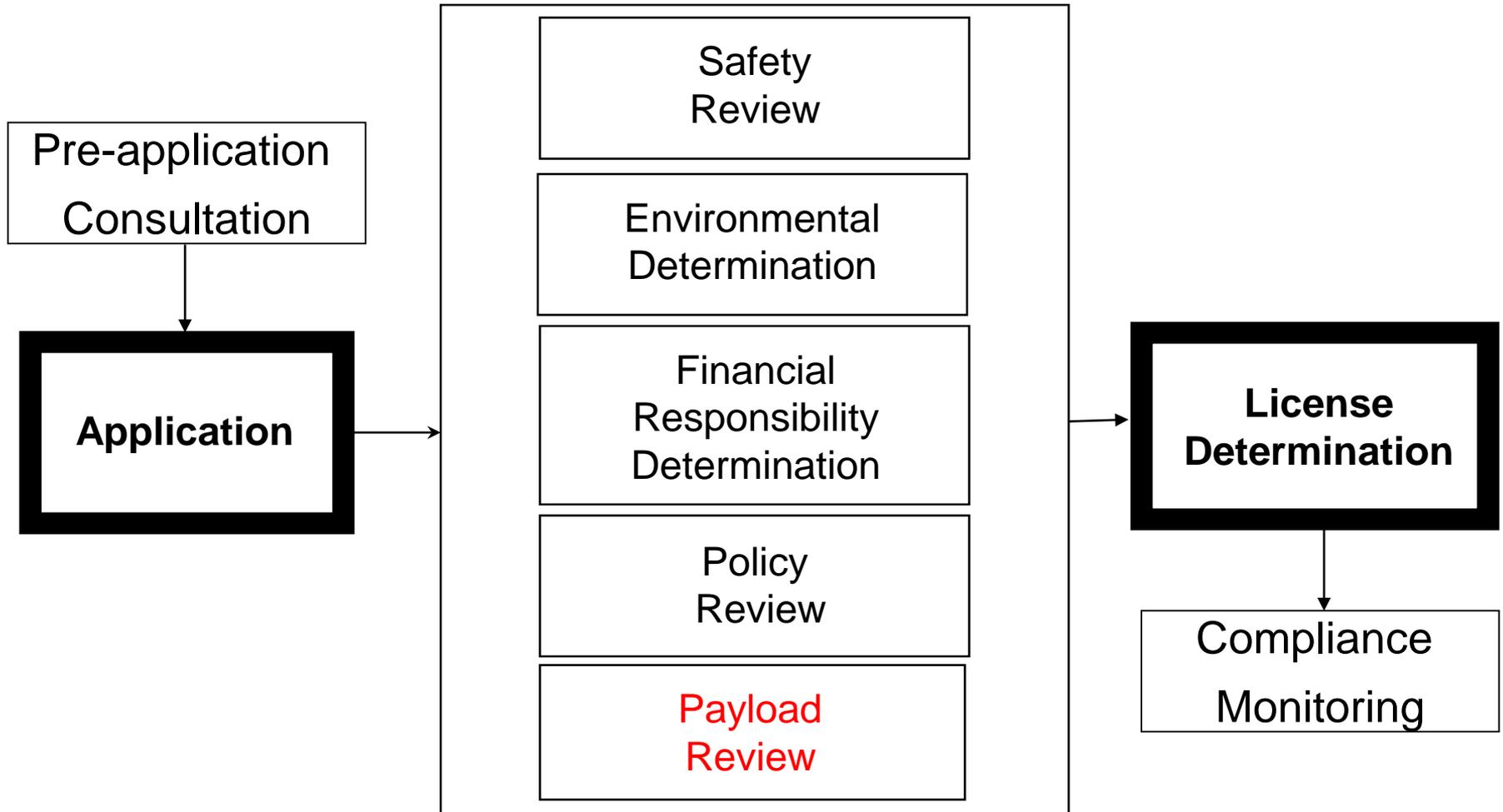
Application Requirements for Policy Review

For a launch license application, applicant must identify:

- Launch vehicle model and configuration
- Launch vehicle systems and propellants
- Foreign ownership of applicant
- Launch vehicle profiles including:
 - Launch site
 - Flight azimuths, trajectories, and ground tracks
 - Sequence of planned events
 - Impact areas for spent motors and other discarded mission hardware
 - For orbital mission, the intermediate and final orbits of upper stage and estimated orbital lifetime.

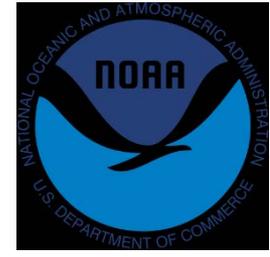
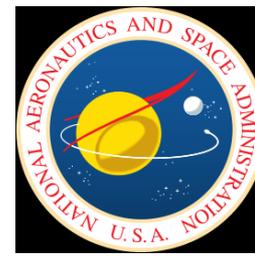
Payload Review

Launch & Reentry Licensing Process Flow



Payload Review

- AST reviews a payload proposed for launch or reentry to determine whether its launch would jeopardize public health and safety, safety of property, U.S. national security or foreign policy interests, or international obligations of the United States.
- For both payload reviews and policy reviews, AST consults with partner agencies to examine the proposed activity from their unique perspectives.



Who May Request a Payload Review?

A payload review may be conducted as part of a license application review or may be requested by a payload owner or operator in advance of or apart from a license application.

If AST makes a favorable payload determination, the payload determination becomes part of the licensing record on which AST's licensing determination is based.

Payload Review

Per §415.53, AST does not conduct a payload review for payloads that are:

- Owned or operated by the U.S. Government;
- Subject to regulation by the Federal Communications Commission (FCC); or
- Subject to regulation by the National Oceanic and Atmospheric Administration (NOAA).

Note: However, AST assesses safety aspects of payloads relative to launch, even if payloads are exempt from an payload review, and includes information in its interagency consultations concerning payloads that may be subject to regulation by FCC or NOAA for the benefit of the interagency partners.

Information Requirements for Payload Review

A person requesting review of a particular payload or payload class must identify the following*:

- Payload name;
- Payload class;
- Physical dimensions and weight of payload;
- Payload owner and operator, if different from person requesting payload review;
- Orbital parameters for parking, transfer and final orbits;
- Hazardous materials, as defined in § 401.5, and radioactive materials, and amounts of each;
- Intended payload operations during life of the payload; and
- Delivery point in flight at which payload will no longer be under licensee's control.

* 14 CFR § 415.59 for payloads on ELVs

Payload Classes

- For launch or reentry operator licenses, payloads are categorized by generic categories or payload classes such as communications, remote sensing, or navigation (14 CFR § 415.55).
- Each payload is subject to compliance monitoring by AST before launch.
- Licensee is responsible for providing current information in accordance with § 417.17(b)(2), regarding a payload proposed for launch not later than 60 days before a scheduled launch.

Non-Traditional Payloads

- Traditional payloads have involved large satellites such as for telecommunications or remote sensing, which typically didn't pose regulatory challenges or issues during payload reviews.
- With the increase in the number of small satellites proposed for scientific and research missions and the innovation of non-traditional payloads such as for satellite servicing or interplanetary missions, payload reviews are undergoing more scrutiny during the interagency reviews.

In Space Commercial Space Operations

Satellite Servicing



Commercial Space Stations



**Space Settlements
Lunar and Mars
Missions**



Lunar and Asteroid Mining

